Number 20 Series 1926

UNITED STATES DEPARTMENT OF AGRICULTURE
BUREAU OF CHEMISTRY AND SOILS
In Cooperation with the Texas Agricultural Experiment Station

SOIL SURVEY
OF
NAVARRO COUNTY, TEXAS

BY

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U. S. Department of Agriculture, in Charge
and E. H. TEMPLIN
Texas Agricultural Experiment Station

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By M. W. BECK, U. S. Department of Agriculture, in Charge, and E. H. TEMPLIN, Texas Agricultural Experiment Station

COUNTY SURVEYED

Navarro County is in east-central Texas. Trinity River forms its eastern boundary, and Corsicana, the county seat, is about 50 miles south and slightly east of Dallas. The county is roughly rectangular in shape, its greatest dimension east and west being about 48 miles and north and south about 33 miles. Its land area is 1,090 square miles or 697,600 acres.

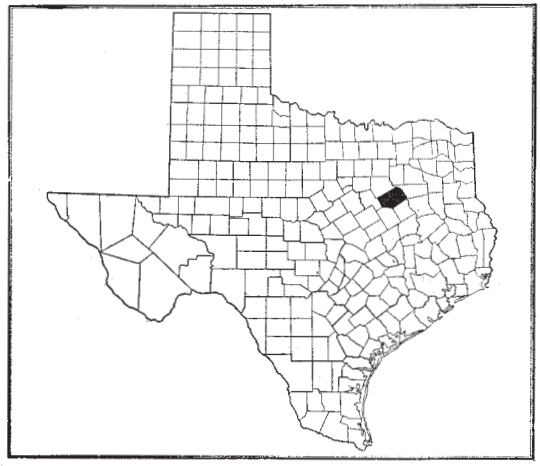

FIGURE 1.—Sketch map showing location of Navarro County, Tex.

Physiographically Navarro County is a plain dissected by many streams, the larger of which have developed fairly deep and wide valleys. Trinity River Valley ranges from a few feet to several miles in width. Brown Valley is the widest part of Trinity Valley in this county. Chambers and Richland Creeks have valleys ranging from a quarter of a mile to 3 miles in width. Strips of overflow land adjacent to all other drainage ways are narrow. All the streams are slow moving and rather sluggish. The channel of Trinity River averages about 100 feet in width and lies from 15 to 20 feet below adjacent land. The other streams have narrow, deep, winding channels. The entire county is drained by Trinity River and its tributaries. Practically all parts are reached by drainage ways affording fair or good surface drainage.

The highest point in the county is 1½ miles northwest of the corner where the boundaries of Freestone, Limestone, and Navarro Counties meet. This ridge is 581 feet above sea level, and the elevation of Corsicana is 445 feet. A rather prominent ridge is 2 miles southeast of Samaria.

The population of Navarro County is mainly American born. The black-land regions are most densely populated. The 1920 census reports an urban population of 11,356 and a rural population of 39,268. Corsicana is the only town in the county of more than 5,000 population. Only about 30 per cent of the 77.6 per cent of the population reported as rural are actually engaged in farming. All towns in the county are more or less dependent on agriculture for their existence, although large oil fields are at Corsicana, Richland, Powell, and Currie. Corsicana has many industries, including oil mills, oil-well supply houses, a twine factory, two oil refineries, pure-food plants, a fruit-cake bakery of national reputation, and a coffee-roasting plant.

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Except in the northeastern and southeastern parts of the county, railroads are within easy access of all farms. Lines of the Southern Pacific and Trinity & Brazos Valley Railway companies traverse the county from north to south, passing through Corsicana. The Texas Electric runs from the north county boundary to Corsicana. The St. Louis Southwestern Railway passes through Corsicana and serves the eastern and western parts of the county. A line of the Missouri Pacific system passes through the extreme northwest corner and gives an outlet for farm products from this section.

Cotton, the principal crop, is marketed mainly in Dallas and Houston, though some is sold in New Orleans. Beef cattle are shipped mainly to Fort Worth and Kansas City. All poultry products are consumed in the county. The vegetables grown do not satisfy local demands. Sufficient watermelons and cantaloupes are grown for home markets.

The roads of Navarro County are principally of dirt and are impassable in wet weather. There are 8 miles of concrete road, and some gravel has been used on a few roads. Dirt roads are well dragged during favorable weather.

Navarro County has many good schools and churches, well distributed according to density of population. Practically all farms are on rural delivery mail routes, and telephones are on most farms.

CLIMATE

Table 1, compiled from the records of the Weather Bureau station at Corsicana, gives the normal monthly, seasonal, and annual temperature and precipitation of Navarro County.

TABLE 1.—*Normal monthly, seasonal, and annual temperature and precipitation at Corsicana*

[Elevation, 445 feet]

Month	Temperature			Precipitation			
	Mean	Absolute maximum	Absolute minimum	Mean	Total amount for the driest year (1917)	Total amount for the wettest year (1877)	Snow, average depth
	°F.	°F.	°F.	Inches	Inches	Inches	Inches
December	48.1	85	8	3.15	0.21	3.96	0.2
January	46.9	88	2	2.31	1.12	1.06	.8
February	49.5	89	−7	2.38	.91	6.84	.5
Winter	48.2	89	−7	7.84	2.24	11.86	1.5
March	58.0	95	18	2.73	1.18	4.81	(1)
April	66.2	96	30	4.11	2.37	6.01	.0
May	73.2	98	31	5.01	3.68	4.75	.0
Spring	65.8	98	18	11.85	7.23	15.57	(1)
June	80.6	107	41	3.12	1.27	4.76	.0
July	84.0	113	54	2.50	2.79	3.50	.0
August	83.4	112	50	2.33	1.76	2.85	.0
Summer	82.7	113	41	7.95	5.82	11.11	.0
September	77.2	104	42	2.57	.72	2.33	.0
October	67.1	98	27	2.72	1.19	6.81	.0
November	56.0	88	18	3.29	2.16	6.21	(1)
Fall	66.8	104	18	8.58	4.07	15.35	(1)
Year	65.9	113	−7	36.22	19.36	53.89	1.5

[1] Trace.

The winters are short and usually mild. The county, as other counties of the region, is affected by northers; that is, rather severe north winds accompanied by a sudden drop in temperature. As a rule these cold spells are of only a few days' duration. Few winters pass without a light fall of snow, which generally melts as it falls. The summers are long and fairly hot. The spring and fall months are pleasant.

The average date of the last killing frost is March 16 and that of the first is November 17. This gives a normal frost-free season of 246 days, sufficient to mature all crops common to this section. The latest recorded killing frost was on May 1 and the earliest on October 22.

The mean annual precipitation of 36.22 inches is fairly evenly distributed, with the greatest rainfall in spring. In some droughty seasons crops are damaged, though a complete crop failure is unknown in this section.

The climate is suited to the production of cotton, oats, corn, grain sorghum, sweetpotatoes, watermelons, cantaloupes, and grasses, and various vegetables, especially tomatoes, onions, cabbage, and cauliflower.

AGRICULTURE

The first settlement in Navarro County was made at Spring Hill in 1838. Corsicana was designated as the county seat in 1848. The first settlers came mainly from Kentucky, Missouri, and Tennessee. They devoted their time almost exclusively to raising cattle and sheep. The first farming was in the sandy timbered areas and along the streams. This early development of these areas was owing largely to the fact that wood for fences, buildings, and fuel was obtainable and that water was available at slight depths. The prairie lands in the early days were not considered good farm lands, and as they supported a dense growth of prairie grass they were used as open range for cattle, horses, and sheep. When barbed wire for fencing became common, about 1880, cultivation of the prairies was started. Farming has gradually expanded to the present, but livestock raising remained an important industry on the prairies for a number of years. The early settlers raised cotton, corn, and some wheat. The cotton was either transported down Trinity River on barges to Galveston or was hauled overland to Houston; the corn was used for food and for feed for livestock; the wheat was ground for flour or hauled to southeast Texas; and most of the cattle were driven to Houston to market.

The building of railroads in Navarro County was followed by rapid agricultural development. The roads gave access to outlying markets and opportunity for settlers to come in.

Cotton has always been the leading crop, but corn, oats, wheat, and forage crops are also important. Vegetables and fruits have always been grown but mainly for home use and local markets.

Table 2 gives the acreage and production of the leading crops in stated years from 1879 to 1924, inclusive.

TABLE 2.—*Acreage and production of the leading crops in Navarro County in stated years*

Year	Cotton		Corn		Oats		Hay and forage		Wheat	
	Acres	*Bales*	*Acres*	*Bushels*	*Acres*	*Bushels*	*Acres*	*Tons*	*Acres*	*Bushels*
1879	47,716	12,958	40,133	521,462	4,288	121,548	[1]774	598	2,872	25,160
1889	66,232	27,100	42,063	990,665	5,378	112,554	[1]6,494	7,044	833	7,075
1899	152,968	60,568	81,897	1,999,340	22,037	664,790	5,854	6,588	6,612	84,310
1909	219,492	59,156	91,091	1,457,467	7,063	130,191	6,148	7,433	275	2,404
1919	261,059	44,394	61,814	1,832,667	37,244	1,003,295	19,863	35,240	10,880	153,883
1924	301,117	81,189	52,666	816,614	9,243	236,687	[1]4,649	24,830	529	14,617

[1] Hay only.

In 1879 the orchard and market-garden products were valued at $15,007 and $1,315, respectively, whereas in 1919 orchard products were valued at $138,383 and vegetables at $311,251. In 1920 there were in the county 6,467 beef cattle, 13,884 dairy cattle, 3,707 sheep, and 18,965 hogs. Dairy products, excluding those used at home, were valued at $414,960 and poultry and eggs at $616,700.

Several ranches in Navarro County are devoted to the production of beef cattle, and there are several dairy herds. Not enough butter and poultry products are produced to supply local demands. Butter is shipped in from California and the northern part of Texas. Many farmers do not keep chickens or cows or raise vegetables. A small part of the corn and sorghum is used for silage, especially on dairy farms.

The steepest lands generally are used for pasture. Vegetables, watermelons, and cantaloupes are, for the most part, grown on the sandy land. The general use of the smoother lands for cotton is for the most part in accordance with the adaptation of the soils, although many unterraced slopes are wasting too rapidly as the result of erosion.

The methods of growing cotton in this county are those in general use in the Cotton Belt. The principal varieties grown are Mebane and Kasch. Small grain is usually planted on cotton land. The principal variety of oats grown is Red Rustproof (Red Texas).

There are many native pecan trees in the bottom lands of the county. They produce rather small nuts. A few of the native orchards have been budded with the larger varieties of nuts.

Chickens and turkeys are raised on a commercial scale by many farmers. There are several large poultry ranches in the vicinities of Dawson and Purdon. The most popular breed of chickens in this section is the White Leghorn.

The 1920 census reports 26.7 per cent of the farms operated by owners and 0.3 per cent by managers. Tenancy has increased from 45.3 per cent in 1880 to 73 per cent in 1920. Efficient laborers are rather hard to obtain. Wages range from $25 to $40 a month, with a house furnished.

The 1880 census reports the average size of farms as 121 acres. In 1920 the average size was 90.1 acres. There are still many large holdings, but these are gradually being divided into smaller farms.

Share rentals are most common, the owner receiving one-fourth the cotton and one-third all other crops. A few farmers rent for cash, paying from $3 to $7 an acre. When the landlord furnishes land and all equipment he receives half the crop.

Farm values in 1925 averaged $8,454 a farm, according to the census. The average acre value of the land was $81.21. The best black land has sold as high as $225 an acre, whereas the poorer grades of sandy land have brought as little as $20 an acre.

SOILS

Navarro County lies within the Gulf coastal plain. At one time this section was covered by water, and the present soil material is of water-deposited origin. This material was washed down from older and higher interior areas on the north and west. Subsequent uplifting of the coast country exposed the materials to soil-forming processes. The present soils are the result of many years of weathering of these marine deposits. Since the Gulf receded stream action has modified the surface configuration of the land considerably, by wearing down valleys and subsidiary depressions.

The soils of Navarro County are derived from four distinct geologic formations,[1] namely, Navarro marl, Taylor marl, Midway shale and limestone, and the Wilcox formations. The Navarro and Taylor marls and Midway limestone, when maturely weathered, give rise to the same soils. The Midway shales and Wilcox formations give rise to soils having profile characteristics unlike those of the soils derived from the marls. The soils from the Midway shales and Wilcox formations contain comparatively little lime carbonate. The strata of the latter formation are in part comprised of sandy material, and the derivative soils accordingly are sandy. On the other hand, most of the county is directly underlain by lime beds, which generally give soils of high lime content. The parent materials of lower lime content outcrop south of Richland Creek in the vicinity of Winkler and along the slopes to Trinity River, north and northeast of Kerens. The sandy prairie soils are derived from sandy layers in marl beds of both the Taylor and Navarro formations. These beds have weathered into a number of distinct soils. In many places the same kind of soil is derived from two or more geologic formations.

The soils fall into two broad divisions as follows: (1) Those derived from the older water-laid deposits; and (2) those derived from recent stream deposits which are still being laid down, and older stream deposits on terraces formed when the streams were flowing at higher levels.

Weathering has effected various changes in the parent materials, giving rise to varied soils. On flat positions where the soil has been subjected to weathering for long periods mature soils have developed. These soils have well-defined topsoil layers over distinct subsoil layers which differ from the third layer, or parent material. Some of the finer material has been washed out or transferred from the upper layer to the subsoil by percolating water, leaving coarser material in the topsoil. The subsoil rests on the less-weathered parent material. On the slopes the soil has tended to wash off as rapidly or about as rapidly as it was formed by alteration of the parent beds, so that the soil on such positions usually consists chiefly of geologic material. This is particularly true on the steepest slopes. In many places, however, even where the soil is shallow, the organic remains of plants have darkened the surface layer.

[1] Udden, J. A., Baker, C. L., and Böse, E. REVIEW OF THE GEOLOGY OF TEXAS. Univ. Tex. Bul. 1916, No. 44, 164 p., illus. 1916.

The soils of Navarro County are grouped in series comprising various soil types. Members of a series resemble each other in color, structure, profile features (layer characteristics), origin of material, chemical features, and drainage conditions. The soil type is determined chiefly by the texture of the surface soil; that is, the comparative content of the various-sized soil particles.

Twenty-two soil types and four phases, representing sixteen soil series, were mapped in the county. The old alluvial soils of the stream terraces or benches have been classed in the Irving, Bell, Lewisville, Myatt, and Milam series and the first-bottom soils still subject to overflow in the Catalpa, Trinity, and Ochlockonee series. The Houston, Sumter, Crockett, Bell, Irving, and Lewisville soils occur under prairie conditions; that is, in grass-covered areas, and the others were developed under timber.

The Houston soils are characterized by ash-gray or black surface soils and dark ash-gray, cream-colored, or pale-yellowish subsoils. Both surface soil and subsoil contain an abundance of lime carbonate. Houston clay and Houston black clay are mapped.

The Sumter soils consist of brown or yellowish-brown surface soils underlain by greenish-yellow subsoils. The material is rich in carbonate of lime. Sumter clay, with a steep and a shallow phase, is mapped.

The Wilson soils are characterized by grayish-brown or dark-brown surface soils and dark-gray or black stiff clay subsoils. The surface soil and upper part of the subsoil contain little lime carbonate, but below a depth of about 20 inches lime concretions are present in many places. There is an abundance of lime in the deep underlying materials. Wilson clay loam, with an undulating phase, Wilson clay, and Wilson fine sandy loam are mapped.

The Crockett soils consist predominantly of grayish-brown or reddish-brown surface soils underlain by dull-red subsoils mottled or splotched with yellow and gray. There is little lime carbonate in the surface soil and upper part of the subsoil, but lime is common in the deep subsoil, especially as concretions. The deeper material consists mainly of marl. Crockett fine sandy loam and Crockett clay loam are mapped.

The Ellis soils have distinctly greenish-brown surface soils, underlain by greenish-brown or brownish-green subsoils. They show no lime reaction with hydrochloric acid. The soil material is tight heavy clay, and there is no sharp line of separation between the surface soil and subsoil. Ellis clay is mapped.

The Oktibbeha soils are mature, and a well-defined line separates the layers from each other. The surface horizon of pale-gray or whitish-gray light-textured material passes abruptly into heavy mottled red, reddish-gray, and yellow stiff sandy clay underlain by more sandy clay parent material. The two upper zones show no reaction for lime with hydrochloric acid, but lime concretions occur below a depth of 15 inches. The lime occurring under these soils distinguishes them from members of the Susquehanna series. Oktibbeha fine sandy loam is mapped.

The Susquehanna soils have pale-gray or yellowish-gray surface soils passing abruptly into tight plastic red and gray mottled subsoils. These soils show no lime reaction with acid. Susquehanna fine sandy loam is mapped.

The Tabor soils differ from the Susquehanna in having yellow subsoils and in being less tenacious and plastic. The surface soils are yellowish gray or pale gray, and the subsoils are yellow and fairly friable. Tabor fine sandy loam is mapped.

The Lewisville soils are characterized by brown surface soils and yellowish-brown or yellow clay subsoils, both rich in lime. Lewisville clay, shallow phase, is mapped.

The Bell soils are identified by their dark-gray or black limy surface soils and subsoils of the same color which become very slightly lighter colored with depth. Bell clay is mapped.

The Irving soils have dark-gray or black surface soils and subsoils. When dry these soils have a dead-grayish appearance, due probably to their low lime content and mature development. The fine sandy loam, clay loam, and clay of this series are mapped.

The Milam soils have reddish-gray or reddish-brown surface soils underlain by yellowish-red compact tight fine sandy clay subsoils. The parent material is yellowish stratified sandy clay and gravel. These soils show no lime reaction with acid. Milam fine sandy loam is mapped.

The Myatt soils have pale ash-gray surface soils, from 4 to 6 inches thick, passing into pale ash-gray subsurface soils mottled rust brown, and these in turn pass into ash-gray plastic clay. Myatt silty clay loam is mapped.

Members of the Catalpa series have brown surface soils and subsoils rich in lime. The parent material has been washed mainly from the Houston and Sumter soils and deposited along the streams and is generally stratified with layers of fine sand. Catalpa silty clay loam and Catalpa clay are mapped.

The Trinity soils are characterized by their dark-gray or black surface soils and subsoils and their high lime content. Trinity clay is mapped.

Members of the Ochlockonee series have gray or grayish-brown surface soils and light-brown or grayish-brown subsoils. These soils show no lime reaction with hydrochloric acid, but with other lime tests they appear strongly alkaline. These soils are derived from sediment deposited by streams that have their source in the region of sandy timbered soils. Ochlockonee fine sandy loam is mapped.

In the following pages the soils of Navarro County are described in detail and their agricultural adaptations are given. Their acreage and proportionate extent are given in Table 3.

TABLE 3.—*Acreage and proportionate extent of the soils mapped in Navarro County, Tex.*

Type of soil	Acres	Per cent	Type of soil	Acres	Per cent
Houston black clay	24,256	3.5	Tabor fine sandy loam	4,352	0.6
Houston clay	83,648	12.0	Irving fine sandy loam	17,664	2.5
Sumter clay	28,352		Irving clay loam	17,728	2.6
Shallow phase	1,536	4.4	Irving clay	23,168	3.3
Steep phase	384		Lewisville clay, shallow phase	6,656	1.0
Wilson fine sandy loam	117,760	16.9	Milam fine sandy loam	5,696	.8
Wilson clay loam	25,856	17.0	Bell clay	11,264	1.6
Undulating phase	93,056		Myatt silty clay loam	1,856	.3
Wilson clay	14,784	2.1	Catalpa clay	78,144	11.2
Ellis clay	5,120	.7	Catalpa silty clay loam	8,640	1.2
Crockett fine sandy loam	41,152	5.9	Trinity clay	44,800	6.4
Crockett clay loam	8,256	1.2	Ochlockonee fine sandy loam	9,536	1.4
Oktibbeha fine sandy loam	7,232	1.0			
Susquehanna fine sandy loam	16,704	2.4	Total	697,600	

HOUSTON BLACK CLAY

Houston black clay consists of dark-gray or black clay continuous to a depth of 3 or more feet with a gradual color change from black to dark gray. Below a depth ranging from 4 to 6 feet is greenish-yellow marl. The material directly above the marl is gray or dark gray and contains lime concretions and, in places, gypsum crystals. The soil material effervesces freely with hydrochloric acid from the surface down.

This soil when plowed is rather lumpy and cloddy, but after a good rain it crumbles into a pulverulent condition. Under proper moisture conditions it cultivates to a fine tilth and the material has a granular structure. Contraction on drying causes cracks several feet deep to form in the virgin soil, but only in very long dry seasons do cracks occur in cultivated fields.

The area mapped as Houston black clay east of Rice has all characteristics of the typical soil, except effervescence in acid. In this area the surface soil material effervesces only slightly, but below a depth of 18 inches it effervesces strongly. On the slopes where the marl lies near the surface this soil has a striped appearance caused by the marl, which consists of yellowish-gray material, coming to the surface in strips alternating with strips of Houston black clay. The material in the lighter-colored bands effervesces freely, but that in the dark strips usually does not effervesce distinctly.

Houston black clay is not very extensive in Navarro County. Large areas occur east of Rice, southeast of Dawson, and at Pinkston, and a few small areas are elsewhere in the western part of the county. The soil occurs mainly on broad, rolling, low ridges or slightly undulating positions. Surface drainage is good, but underdrainage is rather slow owing to the imperviousness of the underlying marl.

Originally this soil had a dense cover of prairie grasses. A very large proportion is now under cultivation, mainly to cotton but to a small extent to corn and oats. Cotton yields from one-fifth to three-fourths bale to the acre, with an average of about one-third bale; corn from 20 to 40 bushels; and oats from 40 to 75 bushels. During the year of the survey (1926), several farmers grew small acreages of Bermuda onions which produced 200 bushels to the acre.

Crop rotation is not practiced on this soil, cotton generally being grown year after year.

Well-improved farms on Houston black clay command from $150 to $225 an acre.

The most important steps in the improvement of this soil would be the construction of efficient terraces on all slopes and the adoption of a good rotation, such as cotton, oats, and corn. The present system of cotton farming causes farmers to buy feedstuffs. Corn would probably prove most profitable if used as silage and for feeding steers and dairy cattle.

HOUSTON CLAY

Houston clay consists of ash-gray clay to a depth of 3 feet. The material gradually becomes lighter in color with depth. The surface soil and subsoil effervesce freely with acid, and small lime particles are common below a depth of 24 inches. The unweathered parent material or marl, which consists of yellowish-green rather platy limy

clay striped with yellow, lies at a depth ranging from 4 to 6 feet. The soil when wet is dark gray but when thoroughly dry is decidedly ash gray. It cracks badly on drying. Owing to its high content of lime and organic matter, this soil when cultivated has a fine tilth. When wet it is exceedingly sticky.

Houston clay occurs in Navarro County in rather large areas, the largest being at Frost, Barry, Emhouse, Montfort, Black Hills School, and east of Dresden. Many smaller areas are throughout the county. The areas are prevailingly undulating or rolling, and in most places surface drainage is good. Underdrainage is rather slow, owing to the tightness of the parent material.

Houston clay is a prairie soil and originally was covered with a dense growth of prairie grasses. It is now all in cultivation, mainly to cotton, though small acreages are used for corn, oats, and maize. Cotton yields range from one-fifth to one-half bale to the acre. Corn yields average about 25 bushels to the acre and those of oats from 40 to 55 bushels.

Land of this kind commands from $100 to $175 an acre.

Terracing is one of the most-needed steps in retaining the fertility of this soil. Farmers also report marked returns from the application of manure. Pecan trees planted on the slopes where water is available during dry weather should prove profitable. Alfalfa, cowpeas, and other legumes could probably be grown profitably.

SUMTER CLAY

Sumter clay to a depth ranging from 2 to 6 inches consists of yellowish-brown clay. This is underlain by yellowish-green or greenish-yellow heavy clay. Lime concretions occur below a depth of 15 or 20 inches. The subsoil is only slightly weathered marl, and the soil is immature. In many places there is no well-defined surface layer, the yellowish material extending from the surface downward. The surface soil and subsoil contain an abundance of lime. The soil is very sticky when wet but when dry breaks up into a fine seed bed.

Sumter clay occurs only on the steepest slopes along drainage ways. The most extensive development is in the vicinity of Lake Halbert and south of Mill Creek and of Montfort. Smaller areas occur elsewhere on steep slopes. Areas are prevailingly steeply sloping and rather badly dissected by short drainage ways. Surface drainage is excessive.

Possibly 25 per cent of this soil is cultivated to cotton, which gives a yield of one-third or one-half bale to the acre. The remainder of the soil is used for pasture and prairie hay land. Pastures will support one animal on each 2 acres, and hay cuts about one-half ton to the acre. There are many native pecan trees on this soil.

This soil can be bought for between $25 and $50 an acre.

The greatest need of Sumter clay, owing to the steep relief, is efficient terracing. The supply of organic matter is very small and should be increased. Sweetclover grown, left on the soil for one or two years, and then plowed under would greatly improve the soil. It seems advisable to use unterraced areas for pasture. As pecan trees are native to this soil, it seems that they should prove profitable if planted on the hillsides.

Sumter clay, shallow phase.—Shallow Sumter clay consists of brown clay from 8 to 10 inches thick, underlain by light-brown or yellowish-

brown heavy sandy clay continuous to lime bedrock which lies at a depth of 2 feet. In places the rock outcroups. In included variations the soil is heavy sandy clay, as the parent rock is sandy limestone. Under cultivation the soil pulverizes well. It does not crack so badly on drying as do the Houston soils. It is derived from the Midway limestone.

Areas are gently sloping to the southeast, and drainage is good. The soil occurs exclusively as small areas in the vicinity of Pisgah Ridge.

About 35 per cent of this soil is cultivated to cotton which produces from one-fourth to three-fourths bale to the acre. Areas in which the rock comes within 10 inches of the surface are used for pasture. One large stone quarry is on this soil. The crushed rock is used for railroad ballast.

For agricultural purposes this soil commands from $35 to $75 an acre.

Sumter clay, steep phase.—The steep phase of Sumter clay is too steep and too badly gullied to be cultivable. The soil is yellow calcareous clay from the surface down. The surface soil found in typical Sumter clay washes off as rapidly as it is formed. Ledge rock is found in places, as well as large calcareous concretions. This phase of soil has no value other than for pasture and is sold with associated soils. It occurs only in small areas. The most extensive development is on the escarpments along Cryer Creek and west of Pisgah Ridge.

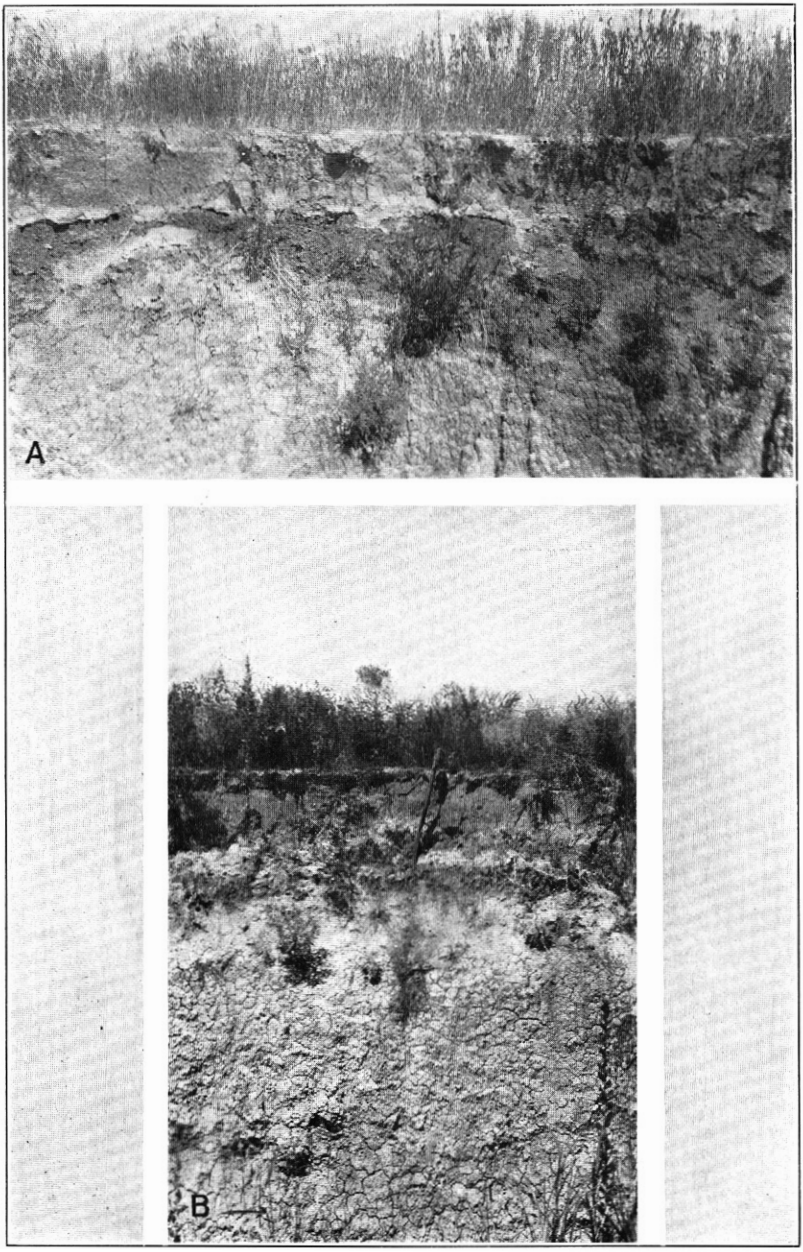
WILSON FINE SANDY LOAM

Wilson fine sandy loam to a depth ranging from 6 to 10 inches consists of brownish-gray loamy fine sand. This grades into gray or dark-gray tight tough fine sandy clay which, in turn, passes into light-gray or olive-colored tough clay at a depth between 30 and 36 inches. When dry this soil has a grayish cast, and the subsoil is exceedingly tough. Water percolates through this tough subsoil slowly, and as a result it is easily water-logged. During dry weather, on the other hand, the tight subsoil gives up its water slowly and causes a droughty conditon. The typical soil shows no reaction for carbonates to a depth of 3 feet. Lime concretions are common at a depth of about 4½ feet. (Pl. 1, A.) Wilson fine sandy loam has been derived from Taylor and Navarro marls and possibly Midway limestone and shale. It is one of the most mature soils in the county, as there is a distinct upper horizon from which the clay material has been leached, and a layer or zone of accumulation.

Areas included with this soil in mapping consist of gray loamy fine sand, from 8 to 12 inches thick, passing into gray fine sandy tight clay mottled with red, beneath which is olive-colored clay.

Wilson fine sandy loam is the most extensive soil in Navarro County. It has a wide distribution and occurs in large areas. The largest are at Eureka, Rodney, Bazette, and Raleigh. Many smaller areas are throughout the county. The tracts are prevailingly flat or slightly sloping. Drainage is poor, owing to the lack of relief and to the tightness of the subsoil.

This is prairie soil, but at present there is on it a scattered growth of mesquite trees in places. About 85 per cent of the soil is in cultivation to cotton and corn, and a small acreage is devoted to watermelons and sweetpotatoes. In years of favorable moisture conditions



A, Profile of Wilson fine sandy loam; B, profile of Crockett fine sandy loam

cotton yields from one-fifth to one-half bale, corn from 15 to 25 bushels, and sweetpotatoes from 75 to 200 bushels to the acre.

This soil is valued at $50 or $75 an acre. Its greatest need for improvement is efficient drainage and an increased supply of organic matter. With heavy applications of lime and phosphate, a very fine growth of sweetclover has been established.

WILSON CLAY LOAM

Wilson clay loam consists of dark grayish-brown clay loam from 4 to 10 inches thick, underlain by dark-gray or black tough clay continuous to a depth of 20 or 30 inches and underlain by ash-gray tough clay. No reaction for lime is obtained with hydrochloric acid to a depth of 3 feet. Commonly at depths of 4 or 5 feet, lime concretions are present and there is a strong effervescence with acid.

There are many so-called "slick spots" in this soil. These slick or bare spots result from the accumulation of soluble salts, mainly sodium chloride, with sufficient sodium carbonate to cause the soil to run together and appear dead. They range from small to 100 or more feet in diameter and are bare of vegetation, owing to the poor physical condition of the soil caused by salt accumulation.

Wilson clay loam has a wide distribution in Navarro County. It occurs as large flats, the largest being at Roane, Richland, Currie, and Rural Shade, and in many smaller areas throughout the prairie section of the county. Tracts occupy flat positions and are comparatively poorly drained, owing to the surface features and tightness of the subsoil.

This is naturally a prairie soil, but in recent years a scattered growth of mesquite trees has started on it. About 90 per cent of the soil is cultivated to cotton, with small acreages in corn and oats. Cotton produces from one-fourth to three-fourths bale to the acre, and under intensive cultivation 2½ bales have been obtained. Corn yields from 15 to 35 bushels and oats from 40 to 75 bushels to the acre.

Land of this kind commands between $75 and $150 an acre.

A 4–12–4 [2] fertilizer has given increased yields on this soil. Deep plowing and plowing under organic matter should improve the land.

Wilson clay loam, undulating phase.—Undulating Wilson clay loam differs from the typical soil only in surface relief, which makes it slightly better drained. The soil consists of dark-gray or dark grayish-brown clay loam from 4 to 10 inches thick, underlain by dark-brown clay continuing to 14 or 16 inches where it gives way to brown clay grading, at a depth between 18 and 22 inches, into ash-gray clay. At a depth of 20 inches, where a strong effervescence is obtained with acid, the material becomes pale-olive or grayish-yellow clay containing numerous lime concretions. Owing to its more rolling relief this soil has not reached so mature a stage of weathering as has the typical soil. This type of land is locally called "rolling mesquite land."

This phase of Wilson clay loam is extensive in Navarro County, occurring in all parts in association with the typical soil. The largest areas are at Kerens, at Tupelo, east of Roane, at Rice, and west of Angus, and many smaller areas occur throughout the county. The

[2] Percentages, respectively, of nitrogen, phosphoric acid, and potash.

relief is undulating or rolling. Surface drainage is good, and underdrainage is fairly well developed.

About 75 per cent of this soil is cultivated to cotton and corn. The remainder is covered with mesquite trees and grass and is used for pasture. Cotton yields from one-fourth to three-fourths bale to the acre and corn from 20 to 35 bushels. In years of sufficient moisture cotton yields are higher on this soil than on the Houston soils.

The current selling price of this land ranges from $75 to $150 an acre.

WILSON CLAY

Typical Wilson clay consists of dark ash-gray or black clay 30 inches thick, underlain by calcareous clay which in places is yellowish green and which contains some lime concretions. In the more poorly drained areas heavy black clay extends to a depth of 30 inches and is underlain by bluish-gray sticky clay. The surface material when dry has a dead ash-gray appearance. The soil breaks down into a fine structural condition when exposed to moisture and air. It is more droughty than the Houston soils.

This soil occurs in rather small patches within large areas of Wilson clay loam. The areas are prevailingly flat or slightly depressed. Some areas west of Corsicana are decidedly rolling and resemble Houston clay. Drainage is poor or lacking, and in many places ditching has been resorted to.

This is prairie soil and is all under cultivation. Cotton is produced exclusively, yields ranging from one-fifth to two-thirds bale to the acre.

Land of this kind commands from $100 to $150 an acre.

Where heavy applications of manure have been made, yields have been increased. Artificial draining has improved the soil.

ELLIS CLAY

Ellis clay to a depth of 8 inches is dark-gray or dark olive-colored clay. Between depths of 8 and 30 inches the material is dark greenish-gray or greenish-brown heavy compact clay. Beneath this is olive-drab heavy clay. A large amount of chert gravel is on the surface. Neither the surface soil nor subsoil shows effervescence with acid. The surface appearance is similar to that of the Houston soils, but on examination the soil presents a rather greasy appearance and when plowed it breaks up into angular lumps. When dry, this soil is difficult to dig into. It is derived from Midway shale.

Ellis clay occurs only in a few rather small areas, but it is a very distinct soil type in the county. The two largest areas are west of Bazette Bridge adjacent to the Trinity River bottom. Areas are rather steeply sloping and rolling, with good surface drainage but very poor underdrainage.

About 5 per cent of this soil is under cultivation. The remainder is covered with a scattered growth of elm, post oak, and mesquite. The timber does not cover more than 50 per cent of the soil. Cotton yields one-third bale to the acre. No native pecan trees are on this soil.

According to farmers, lime and manure give increased yields on this land. Terracing is also essential, as the soil washes badly.

This kind of land commands between $35 and $50 an acre.

CROCKETT FINE SANDY LOAM

Crockett fine sandy loam consists of grayish-red or slightly brownish-red loamy fine sand to a depth ranging from 8 to 15 inches. Below this depth is dull-red clay mottled gray and yellow. The gray and yellow increase with depth, and at a depth between 24 and 30 inches the clay becomes entirely gray. This passes into greenish-yellow calcareous clay at a depth of 4 or 5 feet on the flatter areas. Where the relief is slightly rolling, lime concretions occur at a depth of 30 inches and the yellowish clay is highly calcareous. (Pl. 1, B.)

Large areas of Crockett fine sandy loam are mapped in the vicinity of Angus and north of Dawson. Many smaller areas are mapped on escarpments. The soil usually predominates on broad rolling hills and escarpments where drainage is well developed. Crockett fine sandy loam is the best-drained soil in Navarro County.

Probably 90 per cent of this land is under cultivation, mainly to cotton though small areas are devoted to corn and oats. Cotton yields average one-fourth bale to the acre but range from one-fifth to one-half bale to the acre. Corn yields average 20 bushels to the acre, with limits of 10 and 40 bushels. Oats average 40 bushels to the acre, with minimum of 20 and maximum of 60 bushels. During droughty seasons this soil yields better than Wilson fine sandy loam.

Crockett fine sandy loam commands between $50 and $125 an acre.

The most important step in conserving this soil is terracing. Planting leguminous crops and plowing them under gives increased yields. On land treated with a 300-pound application of a 4–12–4 fertilizer 1 bale of cotton to the acre was obtained in 1926.

CROCKETT CLAY LOAM

Crockett clay loam consists of brown fine sandy clay loam 6 inches thick, grading into brownish-red or reddish-brown heavy clay faintly mottled with yellow and greenish yellow, which is underlain at a depth of 15 inches by greenish-yellow plastic clay becoming calcareous at a depth of 30 inches. The sandy parent marl is reached at a depth of 3 or 4 feet. This material consists of yellow and greenish heavy sandy marl which effervesces freely with hydrochloric acid. In eroded areas the surface soil is red and contains very little sand. It passes into yellowish-green clay at a depth of 10 or 15 inches. Under these areas the subsoil becomes calcareous at a depth of 20 or 24 inches. The parent material lies at a depth of 30 inches.

Crockett clay loam occurs only in small eroded patches throughout areas of Crockett fine sandy loam. As a rule, it occupies ridges and the steeper slopes. Surface drainage is excessive and subsoil drainage good.

Owing to its small extent, Crockett clay loam is not important agriculturally. It is prairie soil, and about 50 per cent of it is under cultivation to cotton. The remainder is used for pasture. Cotton yields from one-fifth to one-half bale to the acre. Pecans do well if water can be supplied during dry seasons.

The average selling price of Crockett clay loam ranges from $40 to $75 an acre.

By properly terracing it and increasing the humus content, this soil could be made productive. At present it washes badly.

OKTIBBEHA FINE SANDY LOAM

Oktibbeha fine sandy loam consists of light ash-gray loamy fine sand from 4 to 6 inches thick, underlain by heavy red clay mottled with gray. The gray increases with depth, and at a depth of 20 or 30 inches the heavy clay becomes greenish yellow, heavy, and plastic and contains small lime concretions. The parent material, which lies at a depth ranging from 4 to 8 feet, consists of streaked greenish-yellow and yellow fine sandy marl. A few included areas, occurring on eroded slopes, are clay loam in texture. This soil closely resembles Susquehanna fine sandy loam in the upper layers but differs from it in the lime content of the lower part of the subsoil. When dry this soil has a whitish surface appearance and tends to run together. It crusts rather badly.

Oktibbeha fine sandy loam is not very extensive. The largest area is in the vicinity of Jester, and a few smaller areas are in other parts of the county in association with the Susquehanna and Crockett soils. The land is prevailingly gently undulating or flat, and drainage is rather poor.

About 30 per cent of this soil is under cultivation. The remainder is timbered with post oak and is used for pasture. The land is considered somewhat better than the corresponding Susquehanna soil. The main crops grown are cotton, corn, and oats. Cotton yields from one-third to one-half bale to the acre, corn from 15 to 35 bushels, and oats from 30 to 45 bushels.

This kind of land commands from $50 to $75 an acre.

The best method of improving the productiveness of this soil is to plow under barnyard manure or green crops such as cowpeas.

SUSQUEHANNA FINE SANDY LOAM

The surface soil of Susquehanna fine sandy loam consists of light-gray fine sand from 6 to 10 inches thick. This grades into mottled red and gray stiff plastic fine sandy clay. The gray increases with depth, and below a depth of 30 inches the clay commonly gives way to yellow and gray stiff plastic clay. In a few areas, particularly on the crests of ridges, the subsoil is red clay free from mottling. These areas would have been mapped as a Kirvin soil, had they been sufficiently large. This soil is derived from the Wilcox formation and shows no effervescence with hydrochloric acid.

Susquehanna fine sandy loam occupies several good-sized areas north and west of Winkler and in the vicinities of Samaria and Princetown School. Areas are undulating, rolling, and steeply sloping. They are subject to severe erosion and are cut by gullies and the beds of small intermittent streams.

Probably 30 per cent of this soil is cultivated. The remainder is covered with post oak, blackjack oak, hickory, and sumac, together with a fair covering of grass which furnishes some pasturage. The cultivated land is used mainly for cotton and corn, with small acreages devoted to watermelons, cantaloupes, and peaches. Cotton yields from one-sixth to one-third bale to the acre, corn from 15 to 30 bushels, watermelons from one-third to one-half carload, and cantaloupes from 100 to 150 crates.

This kind of land commands from $25 to $75 an acre.

The first steps needed in improving Susquehanna fine sandy loam are efficient terracing and increasing the humus content by plowing

under manure or green crops such as cowpeas. Lime has given good results on leguminous crops.

TABOR FINE SANDY LOAM

The surface soil of Tabor fine sandy loam is light yellowish-gray fine sand or loamy fine sand from 6 to 15 inches thick. Below this is yellow or pale-yellow rather stiff fine sandy clay continuous to a depth of 30 inches, where it gives way to pale-yellow stiff fine sandy clay mottled with gray. In dry weather this soil is white. Included in mapping are small areas of Lufkin fine sandy loam, consisting of ash-gray fine sandy loam grading, at a depth between 8 and 12 inches, into ash-gray tight stiff clay. Such areas occur in the small flats at the heads of minor streams. In more rolling areas than typical along the Freestone County line the gray fine sand or loamy fine sand extends to a depth ranging from 24 to 30 inches before it reaches the yellow fine sandy clay subsoil.

The largest areas of this soil are southwest of Winkler. Areas are prevailingly flat or very gently undulating. Surface and internal drainage are rather poor or lacking.

Probably 80 per cent of this soil is under cultivation. The remainder is covered with post oak and blackjack oak, with some pin oak in the wetter areas. The soil is unimproved and is not productive. Cotton, the main crop, makes a poor growth and produces from one-tenth to one-third bale to the acre. Corn yields from 10 to 25 bushels to the acre. Cantaloupes and watermelons are grown on small acreages, with fair success. Peaches do not do very well, owing to insufficient drainage.

Farms on this soil command between $35 and $50 an acre.

Artificial drainage and an increased supply of organic matter are needed for improving this land.

IRVING FINE SANDY LOAM

Irving fine sandy loam consists of dark-gray or grayish-brown heavy fine sandy loam from 6 to 10 inches thick, overlying dark-gray or brown heavy clay. In places the subsoil is bluish gray and is rather tough and compact in the lower part. On drying after rains the surface forms a hard crust, but if the soil is cultivated when moisture conditions are right the surface material becomes loose and friable. In a number of small spots on this soil sufficient alkali is present to retard or prevent vegetable growth. The soluble salts are mainly sodium chloride, but a small quantity of sodium carbonate is present. The sodium carbonate is sufficiently concentrated to cause the surface soil to run together.

This soil occurs as large flats along many of the larger streams of the county. The largest areas are southeast of Navarro and north of Briar and Rush Creeks. Areas are generally flat. Surface drainage is poor, and the heavy subsoil allows only a slow downward movement of water.

Most of this land is in cultivation. Only a small proportion remains in the original forest of post oak, mesquite, and cedar. The important crops are cotton and corn. Cotton yields about one-half bale and corn from 15 to 30 bushels to the acre.

This kind of soil commands between $75 and $150 an acre.

IRVING CLAY LOAM

The surface layer of Irving clay loam consists of grayish-brown or dark ash-gray fine sandy clay loam from 2 to 4 inches thick. This is abruptly underlain by dark-gray or brown heavy clay loam, continuous to a depth of 10 to 15 inches. The subsoil below this depth to from 36 to 48 inches is dark-brown or black heavy tough clay. On drying the surface soil bakes hard, and if plowed when wet hard clods, which are difficult to pulverize, are formed. Neither surface soil nor subsoil effervesces with acid, but at a depth ranging from 40 to 48 inches effervescence is obtained with the concretions present but not with the soil itself.

Irving clay loam occurs mainly in rather large areas, the largest being west of Kerens. Several smaller areas are adjacent to first bottoms of the larger streams. The soil occurs on old terraces in close association with other soils of the Irving series. The surface is flat, and drainage is very poor.

Probably 85 per cent of this soil is in cultivation. The uncleared part supports a forest growth consisting mainly of post oak, hickory, and elm, with cedars in places.

The main crops are corn, cotton, and oats. Cotton yields from one-fourth to three-fourths bale to the acre, corn from 20 to 35 bushels, and oats from 25 to 50 bushels. In one field on this soil in 1926, that had been in alfalfa in 1925, the oats reached a height of 5 feet and produced 75 bushels to the acre.

This land sells at prices ranging from $100 to $150 an acre.

IRVING CLAY

Irving clay consists of dark ash-gray or ash-black clay about 8 or 10 inches thick, underlain by dark-gray, black, or bluish-gray clay which is very tough, especially in the lower part. On the surface this soil closely resembles Bell clay. Neither surface soil nor subsoil shows any effervescence with acid. When dry the surface layer assumes an ash-gray cast. This layer dries out to a compact hard mass which is cultivated with difficulty. It clods badly when plowed wet. After being exposed to rain and wind the clods crumble.

Irving clay occurs in a number of good-sized areas and some small ones scattered over a large part of the county. The main areas are at Powell and along the eastern part of the Freestone County line. The soil occupies flat positions and is nearly level in places. Many areas are basinlike. Drainage is, therefore, rather poor, though usually it is sufficient to allow successful cultivation. In very rainy seasons crops suffer as the result of water standing on the land.

Most of the Irving clay is under cultivation. The greater part originally supported post oak and elm trees, though some of the soil is reported to have been prairie.

The chief crops are cotton, corn, and oats. Cotton yields from one-half to three-fourths bale to the acre, corn from 20 to 35 bushels, and oats from 35 to 55 bushels.

The current selling price of this land ranges from $100 to $175 an acre.

The best method for improving this soil is to ditch it sufficiently to remove excess surface water and plow under manure and green crops.

LEWISVILLE CLAY, SHALLOW PHASE

Lewisville clay, shallow phase, consists of yellow or yellowish-brown clay grading, at a depth of 4 or 6 inches, into yellow clay which continues downward with local stratified layers of sand or gravel occurring in most places at or below a depth of 30 inches. The subsoil contains numerous lime concretions and in places has a decided buff color. The surface soil and subsoil effervesce freely with hydrochloric acid.

This soil occurs as rather steep escarpments adjacent to first-bottom soils on the one hand and to the Bell or Irving soils on the other. There are several rather long but narrow continuous areas throughout the county. The largest areas are on the outer edge of the Powell flat and on the escarpments adjacent to the Mill Creek bottom. Areas are rather steeply sloping, and the run-off is so rapid that the soil washes badly and gullies are formed.

This soil supported a good growth of large native pecan trees. In most places these trees have been removed and the land is now cultivated to cotton, which yields from one-sixth to one-half bale to the acre.

This land commands from $25 to $75 an acre.

Because of the steepness of the slopes, this soil should be efficiently terraced. It probably could most profitably and economically b used for the production of pecans, which are native to it. The wild trees should be budded with marketable varieties. One farmer has top-worked the trees on this soil and is now receiving a large revenue from the nuts.

MILAM FINE SANDY LOAM

The surface soil of Milam fine sandy loam consists of light-brown or reddish-gray loamy fine sand from 8 to 15 inches thick. This is underlain by yellowish-red or reddish-yellow tough compact fine sandy clay. Below a depth ranging from 30 to 36 inches the clay is mottled with yellow, and at a depth of 4 or 5 feet the soil material is yellow fine sandy clay. Included in mapping are three small areas of grayish-brown fine sand.

Milam fine sandy loam occurs in a few rather small areas adjacent to the first bottoms of Trinity River. The largest areas are at Legg and in the northeastern part of the county. The land is undulating, and surface drainage is good and internal drainage fair or good. The soil is retentive of moisture in dry weather.

Probably 90 per cent of this soil is in cultivation to cotton and corn. Cotton yields from one-fourth to three-fourths bale to the acre and corn from 15 to 35 bushels.

Farms on this kind of soil bring from $35 to $75 an acre. Were the areas closer to town, this soil would be valuable for truck crops.

Milam fine sandy loam could be made very productive by using manure and a complete fertilizer. The soil could be utilized more profitably in producing fruit and vegetables rather than the general farm crops.

BELL CLAY

Typical Bell clay consists of black or dark ash-gray clay, which either shows little change to a depth of 3 feet or passes into ash-black or dark ash-gray clay having a faint bluish cast. In very flat areas the grayish color of the surface soil and subsoil is more pronounced than elsewhere. The surface soil and subsoil are very highly calcareous

and contain small lime concretions. The soil is very sticky when wet, but when moisture conditions are favorable it is easily tilled, breaking into a very friable mellow seed bed. This soil differs from Houston black clay only in the substratum. Bell clay is underlain by gravel at a depth of 10 or more feet.

The largest area of Bell clay occurs on the southern part of the Powell flat. Areas are almost level, and some are slightly depressed. In its original state the surface of much of this land is covered with so-called hog wallows, but these disappear after the land is put in cultivation. Surface drainage is rather poor. On many farms where the gravel substratum is absent drainage has been improved by ditching. In wet seasons crops suffer from an excess of moisture, and spring planting is often delayed.

About 90 per cent of this soil is under cultivation. Part of it was originally open prairie, but much was covered with elm, hackberry, and post oak.

Bell clay, under proper moisture conditions, is a very productive soil. Cotton, corn, and oats are the only crops grown. Cotton yields from one-half to 1 bale to the acre, corn from 15 to 40 bushels, and oats from 25 to 70 bushels.

Farms on this kind of land sell for $150 or $200 an acre.

MYATT SILTY CLAY LOAM

Myatt silty clay loam consists of light-gray silty clay loam from 4 to 6 inches thick underlain by light ash-gray plastic clay mottled faintly with yellow which, at a depth between 26 and 30 inches, gives way to ash-gray heavy exceedingly tough clay. In the wetter areas directly beneath the 4 to 6 inch surface soil is a 2 to 4 inch subsurface layer of pale-gray clay mottled with rust brown and underlain by tough plastic ash-gray clay.

Only 2.9 square miles of this soil are mapped in Navarro County. The largest areas are 2 miles south of Tarkingtons Ford and northwest of Daniels Lake. The land is flat or depressed, and drainage is very poor or lacking. The soil remains under water the greater part of the year.

This soil is still covered with a rather dense growth of willow oak, pin oak, elm, hackberry, and post oak. Owing to its poor physical condition, it should probably remain in timber or be used as wood lots and pasture land. It is sold only in conjunction with other soils.

This soil could be utilized in the production of strawberries provided good drainage could be established and manure or 300 pounds to the acre of a 6–10–7 fertilizer applied. Its tough subsoil together with poor drainage makes it an unsatisfactory agricultural soil.

CATALPA CLAY

The surface soil of Catalpa clay consists of brown silty clay. This grades, at a depth of 6 or 8 inches, into pale yellowish-brown plastic silty clay or clay extending to a depth of 3 or more feet. This soil is sticky when wet but on drying crumbles to a desirable structure. The surface soil and subsoil contain an abundance of lime carbonate and effervesce freely with acid.

Catalpa clay is the most extensive bottom-land soil in the county. It occupies first bottoms along Pinoak, Briar, Chambers, and Richland Creeks, and many smaller streams. Areas are flat, but internal

drainage seems to be well established as the soil color indicates good drainage. Overflows occur occasionally.

About 75 per cent of this soil is under cultivation. The remainder is covered with elm, hackberry, and pecan trees, which grow along the stream banks or between the bank and the escarpment in places where sand and gravel lie within 10 feet of the surface. Cotton and corn are the only crops grown. Cotton yields from one-half to 1 bale to the acre and corn from 30 to 60 bushels. Alfalfa has been grown successfully, producing from 4 to 6 tons to the acre.

Farms of this kind of soil command between $50 and $150 an acre.

CATALPA SILTY CLAY LOAM

Catalpa silty clay loam consists of brown silty clay loam, from 8 to 12 inches thick, underlain by yellowish-brown silty clay continuous to a depth of 3 or more feet. The surface soil and subsoil are highly calcareous. This soil is sticky when wet but crumbles when dry, making it easy to obtain a good seed bed. Small areas of fine sandy loam have been included in mapping.

This soil occurs in first bottoms along Cedar, Rush, Alligator, and Battle Creeks. Areas are flat and are occasionally covered by overflows, but drainage is good.

Most of the Catalpa silty clay loam is under cultivation. The remainder is covered with elm, hackberry, ash, and pecan trees. The crops grown and yields obtained are slightly higher than on Catalpa clay. This soil is well suited to alfalfa and pecans but at present is not utilized for these crops.

This kind of soil sells for the same price as Catalpa clay.

TRINITY CLAY

Trinity clay consists of very dark-brown or black clay, from 8 to 12 inches thick, which grades into light-brown, brown, or black clay. There is, however, very little difference in color or texture in the soil from the surface down. In many places the subsoil consists of dark bluish-gray clay. The material is calcareous throughout. Included in mapped areas are small narrow strips of Catalpa silty clay loam adjacent to the stream. When cultivated the surface soil forms a very friable mellow seed bed.

Trinity clay occurs in large areas along Trinity River and extending up the bottoms of tributary streams. The largest areas are in Brown Valley and in parts of Richland Creek bottom. Areas are flat, and drainage is poor. Water remains in numerous low swales for several weeks after a rain. The soil as a whole is sufficiently drained for cultivation.

About 20 per cent of the Trinity clay is under cultivation. The remainder is heavily timbered with elm, hackberry, ash, and red haw, with pecan trees next to the streams. In one area in Richland bottom pecan trees extend from stream to upland escarpment, but under this area a sandy clay substratum lies at a depth between 6 and 10 feet, affording good drainage.

Cotton and corn are the only crops grown on this soil. Cotton yields 1 bale to the acre in favorable seasons and corn from 40 to 60 bushels. In wet seasons the soil does not produce a large crop of cotton, owing to excess vegetation and ravages of the boll weevil. There is no dead cotton caused by root rot fungus in well-drained

situations, but in poorly drained places, considerable dead cotton may be seen.

Trinity clay is a very rich productive soil and is comparatively easy to cultivate when the moisture conditions are right. Land of this kind, where protected by levees, is sold for $100 or $150 an acre, and unprotected timberland is held at $50 or $75 an acre.

The prevention of overflows is the most important step in reclaiming this land. Where protected by levees and properly drained, it should produce good crops of alfalfa.

OCHLOCKONEE FINE SANDY LOAM

Ochlockonee fine sandy loam consists of dark ash-gray or light-brown fine sandy loam from 10 to 18 inches thick, underlain by ash-gray or dark-brown heavy fine sandy loam or friable fine sandy clay. There is no lime reaction with acid in either surface soil or subsoil. This soil is more grayish than typical Ochlockonee soils in counties farther east. The land is very friable and easily tilled.

This soil occurs as first bottoms along streams. The areas, although level, owing to their texture are fairly well drained. This soil is subject to overflow, but the water soon drains off.

Originally this land supported a forest of elm, hackberry, pecan, and water oak, but most of the land has been cleared and is now under cultivation to cotton and corn. Cotton yields from one-third to three-fourths bale to the acre and corn from 25 to 45 bushels. The crops are occasionally ruined by overflow.

This land sells for between $75 and $125 an acre.

The many large native pecan trees on this soil should be budded with improved varieties, and other pecan trees should be planted, as the soil seems ideal for pecan culture.

SUMMARY

Navarro County lies in east-central Texas. It has an area of 1,090 square miles, or 697,600 acres.

The relief ranges from flat to steep and eroded. The elevation averages about 500 feet above sea level. Regional drainage is fairly well established.

The urban population of Navarro County numbered 11,356 in 1920 and the rural population 39,268. The county is well supplied with transportation facilities. The roads are impassable in wet weather but are dragged and kept in good condition during periods of dry weather. Schools are conveniently located in the rural sections. The entire county is supplied with telephone and rural mail service.

The winters are short and moderate, and the summers are moderately long and hot. The rainfall is usually distributed so as to insure crop production.

The greater part of the county is suited to agriculture. General farming is practiced, cotton being the most important crop.

The range in selling price of good agricultural land is from $35 to $225 an acre.

Navarro County includes three distinct soil divisions, as follows: Upland or residual soils; old alluvium or terraces; and first-bottom soils consisting of recent alluvium. The soils range in texture from fine sand to clay, the clay predominating. Members of the Wilson, Houston, and Crockett series are most extensive in the county.

In general, the soils of Navarro County are productive.

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[PUBLIC RESOLUTION—No 9]

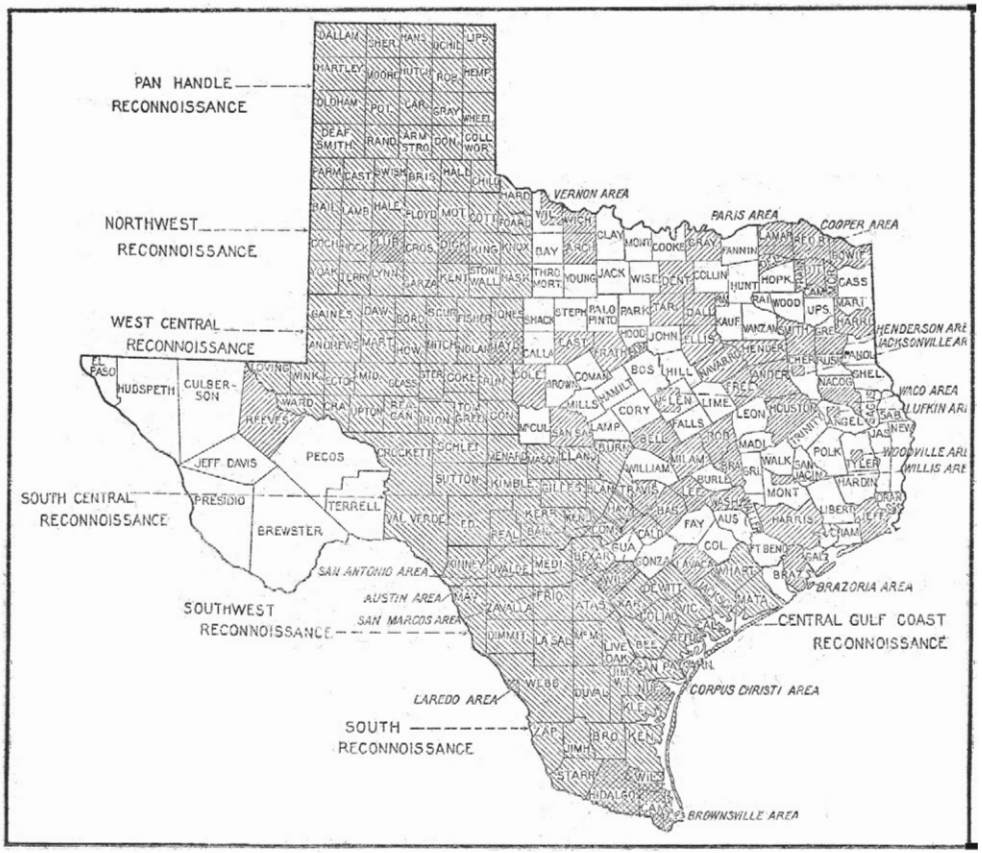
JOINT RESOLUTION Amending public resolution numbered eight, Fifty-sixth Congress, second session, approved February twenty-third, nineteen hundred and one, "providing for the printing annually of the report on field operations of the Division of Soils, Department of Agriculture."

Resolved by the Senate and House of Representatives of the United States of America in Congress assembled, That public resolution numbered eight, Fifty-sixth Congress, second session, approved February twenty-third, nineteen hundred and one, be amended by striking out all after the resolving clause and inserting in lieu thereof the following:

That there shall be printed ten thousand five hundred copies of the report on field operations of the Division of Soils, Department of Agriculture, of which one thousand five hundred copies shall be for the use of the Senate, three thousand copies for the use of the House of Representatives, and six thousand copies for the use of the Department of Agriculture: *Provided,* That in addition to the number of copies above provided for there shall be printed, as soon as the manuscript can be prepared, with the necessary maps and illustrations to accompany it, a report on each area surveyed, in the form of advance sheets, bound in paper covers, of which five hundred copies shall be for the use of each Senator from the State, two thousand copies for the use of each Representative for the congressional district or districts in which the survey is made, and one thousand copies for the use of the Department of Agriculture.

Approved, March 14, 1904.

[On July 1, 1901, the Divison of Soils was reorganized as the Bureau of Soils, and on July 1, 1927, the Bureau of Soils became a unit of the Bureau of Chemistry and Soils.]



Areas surveyed in Texas, shown by shading

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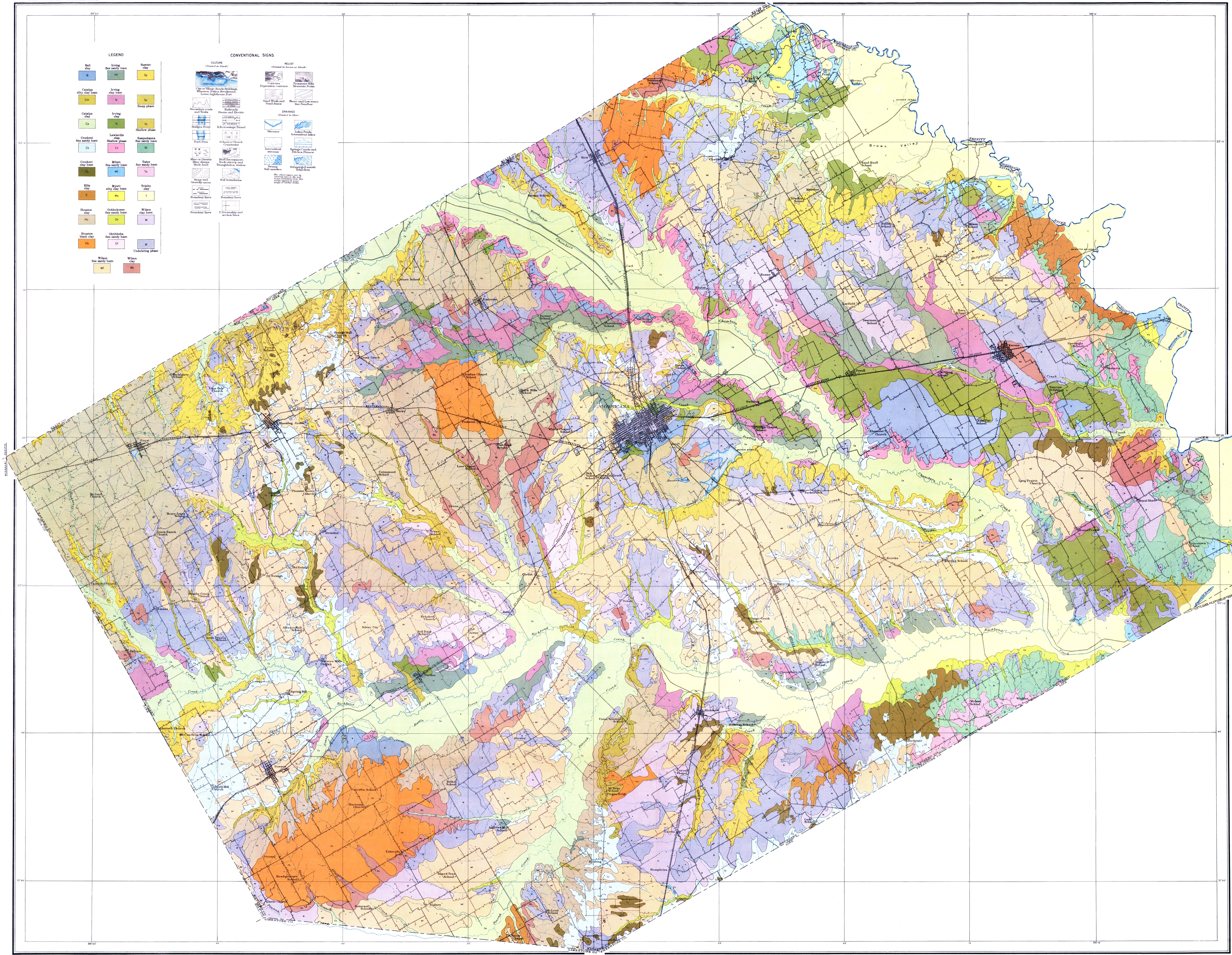
CURTIS F. MARBUT, IN CHARGE SOIL SURVEY

SOIL MAP
NAVARRO COUNTY
TEXAS

TEXAS AGRICULTURAL EXPERIMENT STATION
A. B. CONNER, VICE DIRECTOR



H. H. Bennett, Inspector, District 4.
Soils surveyed by M. W. Beck, U. S. Department of Agriculture,
in charge, and E. H. Templin, Texas Agricultural Experiment Station.

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Field Operations
Bureau of Soils
1926